IDEA

OF

A NEW ANATOMY

OF THE

BRAIN;

SUBMITTED

FOR THE OBSERVATIONS OF HIS FRIENDS;

BY

CHARLES BELL, F.R.S.E.

COLLEGE OF PHYSICIANS

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NOTE.

THE want of any conſiſtent hiſtory of the Brain and Nerves, and the dull unmeaning manner which is in uſe of demonſtrating the brain, may authorize any novelty in the manner of treating the ſubject.

I have found ſome of my friends ſo miſtaken in their conception of the object of the demonſtrations which I have delivered in my lectures, that I wiſh to vindicate myſelf at all hazards. They would have it that I am in ſearch of the ſeat of the ſoul; but I wiſh only to inveſtigate the ſtructure of the brain, as we examine the ſtructure of the eye and ear.

It is not more preſumptuous to follow the tracts of nervous matter in the brain, and to attempt to diſcover the courſe of ſenſation, than it is to trace the rays of light through the humours of the eye, and to ſay, that the retina is the ſeat of viſion. Why are we to cloſe the inveſtigation with the diſcovery of the external organ?

It would have been eaſy to have given this Eſſay an impoſing ſplendour, by illuſtrations and engravings of the parts, but I ſubmit it as a ſketch to thoſe who are well able to judge of it in this ſhape.

The prevailing doctrine of the anatomical ſchools is, that the whole brain is a common ſenſorium; that the extremities of the nerves are organized, ſo that each is fitted to receive a peculiar impreſſion; or that they are diſtinguiſhed from each other only by delicacy of ſtructure, and by a correſponding delicacy of ſenſation; that the nerve of the eye, for example, differs from the nerves of touch only in the degree of its ſenſibility.

It is imagined that impreſſions, thus differing in kind, are carried along the nerves to the ſenſorium, and preſented to the mind; and that the mind, by the ſame nerves which receive ſenſation, ſends out the mandate of the will to the moving parts of the body.

It is further imagined, that there is a ſet of nerves, called vital nerves, which are leſs ſtrictly connected with the ſenſorium, or which have upon them knots, cutting off the courſe of ſenſation, and thereby excluding the vital motions from the government of the will.

This appears ſufficiently ſimple and conſiſtent, until we begin to examine anatomically the ſtructure of the brain, and the courſe of the nerves, — then all is confuſion: the diviſions and ſubdiviſions of the brain, the circuitous courſe of nerves, their intricate connections, their ſeparation and re-union, are puzzling in the laſt degree, and are indeed conſidered as things inſcrutable. Thus it is, that he who knows the parts the beſt, is moſt in a maze, and he who knows leaſt of anatomy, ſees leaſt inconſiſtency in the commonly received opinion.

In oppoſition to theſe opinions, I have to offer reaſons for believing, That the cerebrum and cerebellum are different in function as in form; That the parts of the cerebrum have different functions; and that the nerves which we trace in the body are not ſingle nerves poſſeſſing various powers, but bundles of different nerves, whoſe filaments are united for the convenience of diſtribution, but which are diſtinct in office, as they are in origin from the brain:

That the external organs of the ſenſes have the matter of the nerves adapted to receive certain impreſſions, while the correſponding organs of the brain are put in activity by the external excitement: That the idea or perception is according to the part of the brain to which the nerve is attached, and that each organ has a certain limited number of changes to be wrought upon it by the external impreſſion:

That the nerves of ſenſe, the nerves of motion, and the vital nerves, are diſtinct through their whole courſe, though they ſeem ſometimes united in one bundle; and that they depend for their attributes on the organs of the brain to which they are ſeverally attached.

The view which I have to preſent, will ſerve to ſhew why there are diviſions, and many diſtinct parts in the brain: why ſome nerves are ſimple in their origin and diſtribution, and others intricate beyond deſcription. It will explain the apparently accidental connection between the twigs of nerves. It will do away the difficulty of conceiving how ſenſation and volition ſhould be the operation of the ſame nerve at the ſame moment. It will ſhew how a nerve may loſe one property, and retain another; and it will give an intereſt to the labours of the anatomiſt in tracing the nerves.

I D E A, &c.

WHEN in contemplating the ſtructure of the eye we ſay, how admirably it is adapted to the laws of light! we uſe language which implies a partial, and conſequently an erroneous view. And the philoſopher takes not a more enlarged ſurvey of nature when he declares how curiouſly the laws of light are adapted to the conſtitution of the eye.

This creation, of which we are a part, has not been formed in parts. The organ of viſion, and the matter or influence carried to the organ, and the qualities of bodies with which we are acquainted through it, are parts of a ſyſtem great beyond our imperfect comprehenſion, formed as it ſhould ſeem at once in wiſdom; not pieced together like the work of human ingenuity.

When this whole was created, (of which the remote planetary ſyſtem, as well as our bodies, and the objects more familiar to our obſervation, are but parts,) the mind was placed in a body not merely ſuited to its reſidence, but in circumſtances to be moved by the materials around it; and the capacities of the mind, and the powers of the organs, which are as a medium betwixt the mind and the external world, have an original conſtitution framed in relation to the qualities of things.

It is admitted that neither bodies nor the images of bodies enter the brain. It is indeed impoſſible to believe that colour can be conveyed along a nerve; or the vibration in which we ſuppoſe ſound to conſiſt can be retained in the brain: but we can conceive, and have reaſon to believe, that an impreſſion is made upon the organs of the outward ſenſes when we ſee, or hear, or taſte.

In this inquiry it is moſt eſſential to obſerve, that while each organ of ſenſe is provided with a capacity of receiving certain changes to be played upon it, as it were, yet each is utterly incapable of receiving the impreſſions deſtined for another organ of ſenſation.

It is alſo very remarkable that an impreſſion made on two different nerves of ſenſe, though with the ſame inſtrument, will produce two diſtinct ſenſations; and the ideas reſulting will only have relation to the organ affected.

As the announcing of theſe facts forms a natural introduction to the Anatomy of the Brain, which I am about to deliver, I ſhall ſtate them more fully.

There are four kinds of Papillæ on the tongue, but with two of thoſe only we have to do at preſent. Of theſe, the Papillæ of one kind form the ſeat of the ſenſe of taſte; the other Papillæ (more numerous and ſmaller) reſemble the extremities of the nerves in the common ſkin, and are the organs of touch in the tongue. When I take a ſharp ſteel point, and touch one of *theſe* Papillæ, I feel the ſharpneſs. The ſenſe of *touch* informs me of the ſhape of the inſtrument. When I touch a Papilla of taſte, I have no ſenſation ſimilar to the former. I do not know that

a point

a point touches the tongue, but I am ſenſible of a metallic taſte, and the ſenſation paſſes backward on the tongue.

In the operation of couching the cataract, the pain of piercing the retina with a needle is not ſo great as that which proceeds from a grain of ſand under the eyelid. And although the derangement of the ſtomach ſometimes marks the injury of an organ ſo delicate, yet the pain is occaſioned by piercing the outward coat, not by the affection of the expanded nerve of viſion.

If the ſenſation of light were conveyed to us by the retina, the organ of viſion, in conſequence of that organ being as much more ſenſible than the ſurface of the body as the impreſſion of light is more delicate than that preſſure which gives us the ſenſe of touch; what would be the feelings of a man ſubjected to an operation in which a needle were puſhed through the nerve. Life could not bear ſo great a pain.

But there is an occurrence during this operation on the eye, which will direct us to the truth: when the needle pierces the eye, the patient has the ſenſation of a ſpark of fire before the eye.

This fact is corroborated by experiments made on the eye. When the eye-ball is preſſed on the ſide, we perceive various coloured light. Indeed the mere effect of a blow on the head might inform us, that ſenſation depends on the exerciſe of the organ affected, not on the impreſſion conveyed to the external organ; for by the vibration cauſed by the blow, the ears ring, and the eye flaſhes light, while there is neither light nor ſound preſent.

It may be ſaid, that there is here no proof of the ſenſation being in the brain more than in the external organ of ſenſe. But when the nerve of a ſtump is touched, the pain is as if in the amputated extremity. If it be ſtill ſaid that this is no proper example of a peculiar ſenſe exiſting without its external organ, I offer the following example: Qŭando penis glandem exedat ŭlcŭs, et nihil niſi granulatio maneat, ad extremam tamen nervi pudicæ partem ubi terminatŭr ſenſus ſuperſunt, et exquiſitiſſima ſenſŭs gratificatio.

If light, preſſure, galvaniſm, or electricity produce viſion, we muſt conclude that the idea in the mind is the reſult of an action excited in the eye or in the brain, not of any thing received, though cauſed by an impreſſion from without. The operations of the mind are confined not by the limited nature of things created, but by the limited number of our organs of ſenſe. By induction we know that things exiſt which yet are not brought under the operation of the ſenſes. When we have never known the operation of one of the organs of the five ſenſes, we can never know the ideas pertaining to that ſenſe; and what would be the effect on our minds, even conſtituted as they now are, with a ſuperadded organ of ſenſe, no man can diſtinctly imagine.

As we are parts of the creation, ſo God has bound us to the material world by this law of our nature, that it ſhall require excitement from without, and an operation produced by the action of things external to rouſe our faculties: But that once brought into activity, the organs can be put in exerciſe by the mind, and be made to miniſter to the memory and imagination, and all the faculties of the ſoul.

I ſhall hereafter ſhew, that the operations of the mind are ſeated in the great maſs of the cerebrum, while the parts of the brain to which the nerves of ſenſe tend, ſtrictly form the ſeat of the ſenſation, being the internal organs of ſenſe. Theſe organs are operated upon in two directions. They receive the impreſſion from without, as from the eye and ear: and as their action influences the operations of the brain producing perception, ſo are they brought into action and ſuffer changes ſimilar to that which they experience from external preſſure by the operation of the will; or, as I am now treating of the ſubject anatomically by the operation of the great maſs of the brain upon them.

In all regulated actions of the muſcles we muſt acknowledge that they are influenced through the ſame nerves, by the ſame operation of the ſenſorium. Now the operations of the body are as nice and curious, and as perfectly regulated before Reaſon has ſway, as they are at any time after, when the muſcular frame might be ſuppoſed to be under the guidance of ſenſe and reaſon. Inſtinctive motions are the operations of the ſame organs, the brain and nerves and muſcles, which miniſter to reaſon and volition in our mature years. When the young of any animal turns to the nipple, directed by the ſenſe of ſmelling, the ſame operations are performed, and through the ſame means, as afterwards when we make an effort to avoid what is noxious, or deſire and move towards what is agreeable.

The operations of the brain may be ſaid to be three-fold: 1. The frame of the body is endowed with the characters of life, and the vital parts held together as one ſyſtem through the operation of the brain and nerves; and the ſecret operations of the vital organs ſuffer the controul of the brain, though we are unconſcious of the thouſand delicate operations which are every inſtant going on in the body. 2. In the ſecond place, the inſtinctive motions which precede the developement of the intellectual faculties are performed through the brain and nerves. 3. In the laſt place, the operation of the ſenſes in rouzing the faculties of the mind, and the exerciſe of the mind over the moving parts of the body, is through the brain and nerves. The firſt of theſe is perfect in nature, and independent of the mind. The ſecond is a preſcribed and limited operation of the inſtrument of thought and agency. The laſt begins by imperceptible degrees, and has no limit in extent and variety. It is that to which all the reſt is ſubſervient, the end being the calling into activity and the ſuſtaining of an intellectual being.

Thus we ſee that in as far as is neceſſary to the great ſyſtem, the operation of the brain, nerves, and muſcles are perfect from the beginning; and we are naturally moved to aſk, Might not the operations of the mind have been thus perfect and ſpontaneous from the beginning as well as ſlowly excited into action by outward impreſſions? Then man would have been an inſulated being, not only cut off from the inanimate world around him, but from his fellows; he would have been an individual, not a part of a whole. That he may have a motive and a ſpring to action, and ſuffer pain and pleaſure, and become an intelligent being, anſwerable for his actions, — ſenſation is made to reſult from external impreſſion, and reaſon and paſſion to come from the experience of good and evil; firſt as they are in reference to his corporeal frame, and finally as they belong to the intellectual privations and enjoyments.

THE brain is a maſs of ſoft matter, in part of a white colour, and generally ſtriated; in part of a grey or cineritious colour, having no fibrous appearance. It has grand diviſions and ſubdiviſions: and as the forms exiſt before the ſolid bone incloſes the brain; and as the diſtinctions of parts are equally obſervable in animals whoſe brain is ſurrounded with fluid, they evidently are not accidental, but are a conſequence of internal ſtructure; or in other words they have a correſpondence with diſtinctions in the uſes of the parts of the brain.

On examining the grand diviſions of the brain we are forced to admit that there are four brains. For the brain is divided longitudinally by a deep fiſſure; and the line of diſtinction can even be traced where the ſides are united in ſubſtance. Whatever we obſerve on one ſide has a correſponding part on the other; and an exact reſemblance and ſymmetry is preſerved in all the lateral diviſions of the brain. And ſo, if we take the proof of anatomy, we muſt admit that as the nerves are double, and the organs of ſenſe double, ſo is the brain double; and every ſenſation conveyed to the brain is conveyed to the two lateral parts; and the operations performed muſt be done in both lateral portions at the ſame moment.

I ſpeak of the lateral diviſions of the brain being diſtinct brains combined in function, in order the more ſtrongly to mark the diſtinction betwixt the anterior and poſterior grand diviſions. Betwixt the lateral parts there is a ſtrict reſemblance in form and ſubſtance: each principal part is united by tranſverſe tracts of medullary matter; and there is every proviſion for their acting with perfect ſympathy. On the contrary, the *cerebrum*, the anterior grand diviſion, and the *cerebellum* the poſterior grand diviſion, have ſlight and indirect connection.

In form and diviſion of parts, and arrangement of white and grey matter, there is no reſemblance. There is here nothing of that ſymmetry and correſpondence of parts which is ſo remarkable betwixt the right and left portions.

I have found evidence that the vaſcular ſyſtem of the cerebellum may be affected independently of the veſſels of the cerebrum. I have ſeen the whole ſurface of the cerebellum ſtudded with ſpots of extravaſated blood as ſmall as pin heads, ſo as to be quite red, while no mark of diſeaſe was upon the ſurface of the cerebrum. The action of veſſels it is needleſs to ſay is under the influence of the parts to which they go; and in this we have a proof of a diſtinct ſtate of activity in the cerebrum and cerebellum.

From theſe facts, were there no others, we are entitled to conclude, that in the operations excited in the brain there cannot be ſuch ſympathy or correſponding movement in the cerebrum and cerebellum as there is betwixt the lateral portions of the cerebrum;

brum; that the anterior and poſterior grand diviſions of the brain perform diſtinct offices.

In examining this ſubject further, we find, when we compare the relative magnitude of the cerebrum to the other parts of the brain in man and in brutes, that in the latter the cerebrum is much ſmaller, having nothing of the relative magnitude and importance which in man it bears to the other parts of the nervous ſyſtem; ſignifying that the cerebrum is the ſeat of thoſe qualities of mind which diſtinguiſh man. We may obſerve alſo that the poſterior grand diviſion, or *cerebellum* remains more permanent in form: while the cerebrum changes in conformity to the organs of ſenſe, or the endowments of the different claſſes of animals. In the inferior animals, for example, where there are two external organs of the ſame ſenſe, there is to be found two diſtinct correſponding portions of cerebrum, while the cerebellum correſponds with the frame of the body.

In thinking of this ſubject, it is natural to expect that we ſhould be able to put the matter to proof by experiment. But how is this to be accompliſhed, ſince any experiment direct upon the brain itſelf muſt be difficult, if not impoſſible?—I took this view of the ſubject. The *medulla ſpinalis* has a central diviſion, and alſo a diſtinction into anterior and poſterior faſciculi, correſponding with the anterior and poſterior portions of the brain. Further we can trace down the crura of the *cerebrum* into the anterior faſciculus of the ſpinal marrow, and the crura of the *cerebellum* into the poſterior faſciculus. I thought that here I might have an opportunity of touching the *cerebellum*, as it were, through the poſterior portion of the ſpinal marrow, and the cerebrum by the anterior portion. To this end I made experiments which, though they were not concluſive, encouraged me in the view I had taken.

I found that injury done to the anterior portion of the ſpinal marrow, convulſed the animal more certainly than injury done to the poſterior portion; but I found it difficult to make the experiment without injuring both portions.

Next conſidering that the ſpinal nerves have a double root, and being of opinion that the properties of the nerves are derived from their connections with the parts of the brain, I thought that I had an opportunity of putting my opinion to the teſt of experiment, and of proving at the ſame time that nerves of different endowments were in the ſame cord, and held together by the ſame ſheath.

On laying bare the roots of the ſpinal nerves, I found that I could cut acroſs the poſterior faſciculus of nerves, which took its origin from the poſterior portion of the ſpinal marrow without convulſing the muſcles of the back; but that on touching the anterior faſciculus with the point of the knife, the muſcles of the back were immediately convulſed.

Such were my reaſons for concluding that the cerebrum and the cerebellum were parts diſtinct in function, and that every nerve poſſeſſing a double function obtained that by having a double root. I now ſaw the meaning of the double connection of the nerves with the ſpinal marrow; and alſo the cauſe of that ſeeming intricacy in the connections of nerves throughout their courſe, which were not double at their origins.

The ſpinal nerves being double, and having their roots in the ſpinal marrow, of which a portion comes from the cerebrum and a portion from the cerebellum, they convey the attributes of both grand diviſions of the brain to every part; and therefore the diſtribution of ſuch nerves is ſimple, one nerve ſupplying its deſtined part. But the nerves which come directly from the brain, come from parts of the brain which vary in operation; and in order to beſtow different qualities on the parts to which the nerves are diſtributed, two or more nerves muſt be united in their courſe or at their final deſtination.

nation. Hence it is that the 1ſt nerve muſt have branches of the 5th united with it: hence the *portio dura* of the 7th pervades every where the bones of the cranium to unite with the extended branches of the 5th: hence the union of the 3d and 5th in the orbit: hence the 9th and 5th are both ſent to the tongue: hence it is, in ſhort, that no part is ſufficiently ſupplied by one ſingle nerve, unleſs that nerve be a nerve of the ſpinal marrow, and have a double root, a connection (however remotely) with both the cerebrum and cerebellum.

Such nerves as are ſingle in their origin from the ſpinal marrow will be found either to unite in their courſe with ſome other nerve, or to be ſuch as are acknowledged to be peculiar in their operation.

The 8th nerve is from the portion of the *medulla oblongata* * which belongs to the cerebellum: the 9th nerve comes from the portion which belongs to the cerebrum. The firſt is a nerve of the claſs called Vital nerves; controuling ſecretly the operation of the body; the laſt is the Motor nerve of the tongue, and is an inſtrument of volition. Now the connections formed by the 8th nerve in its courſe to the viſcera are endleſs; it ſeems no where ſufficient for the entire purpoſe of a nerve; for every where it is accompanied by others, and the 9th paſſes to the tongue, which is already profuſely ſupplied by the 5th.

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* The *medulla oblongata* is only the commencement of the ſpinal marrow.

Underſtanding the origin of the nerves in the brain to be the ſource of their powers, we look upon the connections formed betwixt diſtant nerves, and upon the combination of nerves in their paſſage, with ſome intereſt; but without this the whole is an unmeaning tiſſue. Seeing the ſeeming irregularity in one ſubject, we ſay it is accident; but finding that the connections never vary, we ſay only that it is ſtrange, until we come to underſtand the neceſſity of nerves being combined in order to beſtow diſtinct qualities on the parts to which they are ſent.

The *cerebellum* when compared with the *cerebrum* is ſimple in its form. It has no internal tubercles or maſſes of cineritious matter in it. The medullary matter comes down from the cineritious cortex, and forms the *crus;* and the *crus* runs into union with the ſame proceſs from the cerebrum; and they together form the *medulla ſpinalis*, and are continued down into the ſpinal marrow; and theſe crura or proceſſes afford double origin to the double nerves of the ſpine. The nerves proceeding from the Crus Cerebelli go every where (in ſeeming union with thoſe from the Crus Cerebri); they unite the body together, and controul the actions of the bodily frame; and eſpecially govern the operation of the viſcera neceſſary to the continuance of life.

In all animals having a nervous ſyſtem, the *cerebellum* is apparent, even though there be no *cerebrum*. The cerebrum is ſeen in ſuch tribes of animals as have organs of ſenſe, and it is ſeen to be near the eyes, or principal organ of ſenſe; and ſometimes it is quite ſeparate from the *cerebellum*.

The cerebrum I conſider as the grand organ by which the mind is united to the body. Into it all the nerves from the external organs of the ſenſes enter; and from it all the nerves which are agents of the will paſs out.

If this be not at once obvious, it proceeds only from the circumſtance that the nerves take their origin from the different parts of the brain; and while thoſe nerves are conſidered as ſimple cords, this circumſtance ſtands oppoſed to the concluſion which otherways would be drawn. A nerve having ſeveral roots, implies that it propagates its ſenſation to the brain generally. But when we find that the ſeveral roots are diſtinct in their endowments, and are in reſpect to office diſtinct nerves; then the concluſion is unavoidable, that the portions of the brain are diſtinct organs of different functions.

To arrive at any underſtanding of the internal parts of the cerebrum, we muſt keep in view the relation of the nerves, and muſt claſs and diſtinguiſh the nerves, and follow them into its ſubſtance. If all ideas originate in the mind from external impulſe, how can we better inveſtigate the ſtructure of the brain than by following the nerves, which are the means of communication betwixt the brain and the outward organs of the ſenſes?

The nerves of ſenſe, the olfactory, the optic, the auditory, and the guſtatory nerve, are traced backwards into certain tubercles or convex bodies in the baſe of the brain. And I may ſay, that the nerves of ſenſe either form tubercles before entering the brain, or they enter into thoſe convexities in the baſe of the *cerebrum.* Theſe convexities are the conſtituent parts of the cerebrum, and are in all animals neceſſary parts of the organs of ſenſe: for as certainly as we diſcover an animal to have an external organ of ſenſe, we find alſo a medullary tubercle; whilſt the ſuperiority of animals in intelligence is ſhewn by the greater magnitude of the hemiſpheres or upper part of the cerebrum.

The convex bodies which are ſeated in the lower part of the cerebrum, and into which the nerves of ſenſe enter, have extenſive connexion with the hemiſpheres on their upper part. From the medullary matter of the hemiſpheres, again, there paſs down, converging to the crura, Striæ, which is the medullary matter taking upon it the character of a nerve; for from the Crura Cerebri, or its prolongation in the anterior Faſciculi of the ſpinal marrow, go off the nerves of motion.

But with theſe nerves of motion which are paſſing outward there are nerves going inwards; nerves from the ſurfaces of the body; nerves of touch; and nerves of peculiar ſenſibility, having their ſeat in the body or viſcera. It is not improbable that the tracts of cineritious matter which we obſerve in the courſe of the medullary matter of the brain, are the ſeat of ſuch peculiar ſenſibilities; the organs of certain powers which ſeem reſident in the body.

As we proceed further in the inveſtigation of the function of the brain, the diſcuſſion becomes more hypothetical. But ſurely phyſiologiſts have been miſtaken in ſuppoſing it neceſſary to prove ſenſibility in thoſe parts of the brain which they are to ſuppoſe the ſeat of the intellectual operations. We are not to expect the ſame phenomena to reſult from the cutting or tearing of the brain as from the injury to the nerves. The function of the one is to tranſmit ſenſation; the other has a higher operation. The nature of the organs of ſenſe is different; the ſenſibilities of the parts of the body are very various. If the needle piercing the retina during the operation of couching gives no remarkable pain, except in touching the common coats of the eye, ought we to imagine that the ſeat of the higher operations of the mind ſhould, when injured, exhibit the ſame effects with the irritation of a nerve? So far therefore from thinking the parts of the brain which are inſenſible, to be parts inferior (as every part has its uſe), I ſhould even from this be led to imagine that they had a higher office. And if there be certain parts of the brain which are inſenſible, and other parts which being injured ſhake the animal with convulſions exhibiting phenomena ſimilar to thoſe of a wounded nerve, it ſeems to follow that the latter parts which are endowed with ſenſibility like the nerves are ſimilar to them in function and uſe; while the parts of the brain which poſſeſs no ſuch ſenſibility are different in function and organization from the nerves, and have a diſtinct and higher operation to perform.

If in examining the apparent ſtructure of the brain, we find a part conſiſting of white medullary Striæ and faſciculated like a nerve, we ſhould conclude that as the uſe of a nerve is to tranſmit ſenſation, not to perform any more peculiar function, ſuch tracts of matter are media of communication, connecting the parts of the brain; rather than the brain itſelf performing the more peculiar functions. On the other hand, if maſſes are found in the brain unlike the matter of the nerve, and which yet occupy a place guarded as an organ of importance, we may preſume that ſuch parts have a uſe different from that of merely conveying ſenſation; we may rather look upon ſuch parts as the ſeat of the higher powers.

Again, if thoſe parts of the brain which are directly connected with the nerves, and which reſemble them in ſtructure, give pain when injured, and occaſion convulſion to the animal as the nerves do when they are injured; and if on the contrary ſuch parts as are more remote from the nerves, and of a different ſtructure, produce no ſuch effect when injured, we may conclude, that the office of the latter parts is more allied to the intellectual operations, leſs to mere ſenſation.

I have found at different times all the internal parts of the brain diſeaſed without loſs of ſenſe; but I have never ſeen diſeaſe general on the ſurfaces of the hemiſpheres without derangement or oppreſſion of the mind during the patient's life. In the caſe of derangement of mind, falling into lethargy and ſtupidity, I have conſtantly found the ſurface of the hemiſpheres dry and preternaturally firm, the membrane ſeparating from it with unuſual facility.

If I be correct in this view of the ſubject, then the experiments which have been made upon the brain tend to confirm the concluſions which I ſhould be inclined to draw from ſtrict anatomy; viz. that the cineritious and ſuperficial parts of the brain are the ſeat of the intellectual functions. For it is found that the ſurface of the brain is totally inſenſible, but that the deep and medullary part being wounded the animal is convulſed and pained.

At firſt it is difficult to comprehend, how the part to which every ſenſation is referred, and by means of which we become acquainted with the various ſenſations, can itſelf be inſenſible; but the conſideration of the wide difference of function betwixt a part deſtined to receive impreſſions, and a part which is the ſeat of intellect, reconciles us to the phenomenon. It would be rather ſtrange to find, that there were no diſtinction exhibited in experiments on parts evidently ſo different in function as the organs of the ſenſes, the nerves, and the brain. Whether there be a difference in the matter of the nervous ſyſtem, or a diſtinction in organization, is of little importance to our enquiries, when it is proved that their eſſential properties are different, though their union and co-operation be neceſſary to the completion of their function—the developement of the faculties by impulſe from external matter.

All ideas originate in the brain: the operation producing them is the remote effect of an agitation or impreſſion on the extremities of the nerves of ſenſe; directly they are conſequences of a change or operation in the proper organ of the ſenſe which conſtitutes a part of the brain, and over theſe organs, once brought into action by external impulſe, the mind has influence. It is provided, that the extremities of the nerves of the ſenſes ſhall be ſuſceptible each of certain qualities in matter; and betwixt the impreſſion of the outward ſenſe, as it may be called, and the exerciſe of the internal organ, there is eſtabliſhed a connection by which the ideas excited have a permanent correſpondence with the qualities of bodies which ſurround us.

From the cineritious matter, which is chiefly external, and forming the ſurface of the cerebrum; and from the grand center of medullary matter of the cerebrum, what are called the *crura* deſcend. Theſe are faſciculated proceſſes of the cerebrum, from which go off the nerves of motion, the nerves governing the muſcular frame. Through the nerves of ſenſe, the *ſenſorium* receives impreſſions, but the will is expreſſed through the medium of the nerves of motion. The ſecret operations of the bodily frame, and the connections which unite the parts of the body into a ſyſtem, are through the cerebellum and nerves proceeding from it.

THE END.

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